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AN OBJECTIVE MEASURE OF STRUCTURAL COMPLEXITY IN CHILDREN'S WRITING.

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AN INSTRUMENT FOR MEASURING LANGUAGE MATURITY SHOULD BE EASILY ADMINISTRABLE AND SCOREABLE AND SHOULD BE BASED ON VALID INDICES OF LANGUAGE MATURITY. A RECENT STUDY BY KELLOG W. HUNT SUGGESTED THAT THESE INDICES BE BASED ON A NEW SYNTACTIC UNIT, THE T-UNIT, CONSISTING OF 1 MAIN CLAUSE TOGETHER WITH ANY CLAUSES SUBORDINATED TO IT. COORDINATED MAIN CLAUSES, WHICH ARE USUALLY A SIGN OF IMMATURITY, WILL THUS HAVE NO EFFECT ON THE INDEX. HUNT'S STUDIES, BASED ON 1000-WORD SAMPLES, INDICATED THAT T-UNIT LENGTH, CLAUSE LENGTH, AND NUMBER OF CLAUSES PER T-UNIT INCREASED FROM GRADES 4 TO 12. TO SEE IF THE INDICES COULD BE RELIABLY COMPUTED FROM SHORTER SAMPLES, 80 CHILDREN IN GRADES 4, 6, AND 8 WERE ASKED TO REWRITE A NARRATIVE COMPOSED OF SIMPLE DECLARATIVE SENTENCES, COMBINING THESE INTO LONGER UNITS. ALSO, 69 CHILDREN IN GRADES 4, 8, AND 12 WERE ASKED TO REWRITE A STRUCTURALLY SIMPLIFIED EXPOSITORY ESSAY USING LONGER SENTENCES. OBSERVED INCREASES WITH GRADE IN THE CLAUSE LENGTH, T-UNIT LENGTH, AND NUMBER OF CLAUSES PER T-UNIT WERE STATISTICALLY SIGNIFICANT. BECAUSE OF THE INTERRELATION OF THE INDICES, T-UNIT LENGTH APPEARS TO BE THE MOST USEFUL INDEX. FURTHER REFINEMENT OF THE NARRATIVE AND THE ESSAY IS NECESSARY, TOGETHER WITH STUDIES TO DETERMINE THEIR GENERAL VALIDITY AND RELIABILITY. THE PAPER WAS PRESENTED AT THE ANNUAL MEETING OF AMERICAN EDUCATIONAL RESEARCH ASSOCIATION, FEBRUARY 9, 1968. (DR)

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AN OBJECTIVE MEASURE OF STRUCTURAL COMPLEXITY IN CHILDREN'S WRITING

In a study reported thirty years ago, John E. Anderson (1) evaluated by statistical methods three indexes of language development. He reported data on sentence length and pronoun index, but his study was primarily concerned with the subordination index which had been worked out a short time earlier by Lou L. LaBrant (3).

Anderson was interested in the generality of LaBrant's index and in the possibility of developing an easily applied and uniform measuring implement. Because of such variables as composition length, subject matter, and situations in which language is used, he drew pessimistic conclusions about generalized application of the subordination index. He recognized, however, the existence of "...a fertile field for the development of indices based on common subject matter, well-categorized scales, and adequate samples from the standpoint of length of passage."

Subsequent investigations of children's language have relied heavily on mean sentence length and the subordination index; and, until recently, not much progress seems to have been made toward an easily applied and uniform measurement of language development. Recently developed techniques of linguistic analysis, however, offer new hope that such an instrument can be devised.

To be practical, an instrument for measuring language development would possess the following characteristics: 1) It would be based on a reliable and valid index of language maturity; 2) It would be easily administered; 3) It would be easily scored. In addition, it should reduce to a minimum the effects of variables

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such as length of composition, subject matter, and conditions under which the writing samples are produced. This report deals with an investigation of the feasibility of devising a useful instrument based on recently developed indexes of language development.

In his study of children's grammatical structures written at three grade levels, Kellogg W. Hunt (2) gives a critical evaluation of the traditional indexes of language development and proposes some new indexes. Pointing out the fact that inadequate punctuation and indiscriminate use of and makes sentence length an unreliable index, Hunt proposes a syntactic unit consisting of one main clause and any subordinate clauses attached to the main clause. Such a unit is grammatically capable of being considered a sentence; and since it is a terminable unit, he proposes that it be called a T-unit. This unit can be identified objectively, and it is not affected by poor punctuation. It has the added advantage of preserving all the subordination achieved by the student and all of his coordination of words, phrases, and subordinate clauses. It does not preserve the student's coordination of main clauses; but, as Hunt points out, excessive coordination of main clauses is a sign of immaturity rather than maturity. Thus, the elimination of coordinated main clauses from the syntactic unit to be used in language development studies is a gain rather than a loss.

Hunt calls attention to the fact that LaBrant counted coordinated verbs as separate clauses, and he insists that a clause is a structure with a subject and a finite verb. Then, having identified a syntactic

unit more useful than the sentence and having clarified the definition of the clause, Hunt proposes a revision of the subordination index. Instead of dividing the number of subordinate clauses by the total number of clauses, he proposes that the total number of clauses be divided by the number of main clauses. This procedure would give the mean number of clauses per T-unit, which can be converted into the ratio of subordinate clauses to main clauses.

Computing these proposed indexes for the materials analyzed in his study, Hunt found statistically significant increases in T-unit length, clause length, and number of clauses per T-unit from grade four to grade eight to grade twelve. It should be pointed out that the three measures under consideration are interrelated. T-units can be lengthened by either or both of two means: lengthening clauses or increasing the number of subordinate clauses. Analysis based on techniques of transformational-generative grammar reveals that syntactic complexity of children's language is reflected in both clause length and number of clauses per T-unit. T-unit length can be computed by multiplying words per clause by number of clauses per T-unit; and since T-unit length incorporates the other two indexes, it is evident that T-unit length is a useful index of structural complexity.

Hunt's conclusions were based on his analysis of 1,000 words written by each student participating in his study. Such lengthy samples are desirable for statistical reasons, but they are too long for easy analysis. In order to see whether the indexes Hunt proposed could be computed from smaller samples, this investigator devised an experimental instrument for collecting comparable writing samples from

children at various grade levels.

Writing samples were gathered from 80 pupils enrolled in the public schools of High Point, North Carolina, in the spring of 1966. There were 24 pupils in grade four, 28 pupils in grade six, and 28 pupils in grade eight. In an extension of the study, writing samples were gathered from 69 pupils (26 in grade four, 20 in grade eight, 23 in grade twelve) enrolled in the University School (FSU), Tallahassee, Florida.

In order to obtain comparable samples of children's writing, the investigator asked the High Point school children to rewrite a narrative composed of simple declarative sentences. They were asked to rewrite the story, putting the short sentences together to make longer sentences. In this way they could demonstrate their ability to combine kernel structures to form sentences of greater structural complexity. Each child's writing was segmented into T-units, and the following computations were made for each composition: 1) mean number of words per clause; 2) mean number of clauses per T-unit; and 3) mean number of words per T-unit. Statistical enalysis of variance was executed to test for significance at the .01 level the mean differences at various grade levels. Subsequently, a structurally simplified expository essay was presented to University School students, with instructions to rewrite the essay using longer and better sentences. The resulting compositions were analyzed in the same manner as the narrative compositions.

In the narrative compositions, mean words per clause increased from 6.41 for grade four to 7.11 for grade six, and to 8.17 for grade eight

(F ratio, 22.78). Mean clauses per T-unit increased from 1.14 to 1.30 to 1.45 for the three grades (F ratio, 23.24). Mean words per T-unit increased from 7.37 to 9.27 to 12.01 (F ratio, 39.20). Increments on each of the three indices are significant at the .01 level. In the expository compositions, mean T-unit length increased from 6.10 to 8.48 to 10.98 from grade four to grade eight to grade twelve (F ratio, 59.11). Mean clause length increased from 5.76 to 6.53 to 8.45 for the three grades (F ratio, 56.39). Mean number of clauses per T-unit increased from 1.05 to 1.29 to 1.30 (F ratio, 24.65). These increments are also significant at the .01 level.

It was pointed out earlier that both clause length and number of clauses per T-unit reflect syntactic complexity. Data resulting from this study indicate that both clause length and number of clauses per T-unit increase together at the lower grade levels, but that clause length accounts for most of the growth at higher grade levels. Since T-unit length is accounted for by a combination of these two factors (mean clause length x mean clauses per T-unit = mean T-unit length), it appears that T-unit length is a useful index of growth in structural complexity over a wide age-range.

It should be noted at this point that syntactic complexity is only one factor in language maturity. A complex unit is not necessarily a well-constructed unit, and there is no doubt that stylistic maturity is manifested in a writer's ability to avoid complexity as well as in his ability to produce it. However, there is sufficient evidence to support the assertion that syntactic complexity is a major factor in language maturity, and a preliminary study recently completed indicates

that there is a significant correlation between complexity scores and overall rating scores on compositions written by ninth grade students.

The basic difference between the present study and Hunt's study lies in the method of obtaining writing samples. Hunt's analysis was based on large samples of writing collected over an extended period of time; this study was based on single samples taken (with the exception of a few fourth grade expository essays) in a single class period. Since the mean values of the three measures investigated in this study are comparable to those obtained by Hunt, the findings of this study lend support to Hunt's findings and suggest the feasibility of designing standardized instruments to measure language development.

When evaluated in the light of the criteria suggested earlier, the experimental instruments used in this study obviously need further refinement. The narrative instrument employed in this study was found to be unsuitable for use beyond the eighth grade, and the expository instrument was too lengthy for some fourth graders to complete in a single class period. Although it is evident that clause length, T-unit length, and number of clauses per T-unit increase with advance in grade, there are no data to show how consistently these indexes measure the structural complexity of an individual student's writing in various situations.

In a recently completed study, Professor Hunt has shown that a shortened form of the expository essay described above is useful for collecting writing samples from pupils in grades four through twelve. His analysis of writing samples collected by means of this instrument shows essentially the same rate of increment on the three indexes of

complexity as he found in his earlier study. Thus, it seems that considerable progress has been made toward devising an instrument that is easily administered and easily scored. Further study of validity and reliability of instruments such as these is urgently needed.

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